BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL VETERINARY BULLETIN.

VOL. 16.] September 1, 1928. [No. 3.

DISEASES DUE TO PROTOZOAN PARASITES.

CURSON (H. H.). **A Note on the Trypanosomes of Nagana in South Africa.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1927. Aug. 31. Vol. 21. No. 2. pp. 109–112. [16 refs.]

Although the work of ROUBAUD and BRUCE has cleared up many of the difficulties regarding the trypanosomes of man and animals in Africa, the three types of trypanosomes responsible for nagana have not yet been recorded in the four territories south of the Zambesi, where glossinae are found. All these, namely *T. congolense*, *T. vivax*, and *T. brucei* occur in Zululand, Bechuanaland, S. Rhodesia, and Mozambique.

Zululand.

*T. brucei.**—The organism, originally sent to England in a dog by BRUCE in 1895, was not, as was thought at the time, the strain responsible for nagana in cattle, but one which it is now known is exceedingly pathogenic for equines and canines.

T. congolense.—This trypanosome is now known to be responsible for the majority of cases of nagana in cattle. It is probable that BRUCE saw *T. congolense*, as in one of the plates of his original report trypanosomes suggestive of this type are shown. Curson states that he has encountered a particularly virulent strain of *T. congolense* in the pig, reminding him of *T. simiae*, Bruce.

Bechuanaland Protectorate.

T. congolense.—The occurrence of trypanosomes of this type was recorded by ANDREWS in 1912.

T. vivax.—Was recorded by Curson in 1925.

T. brucei.—In blood smears from fly-struck dogs Curson found *T. brucei* in December, 1926.

Southern Rhodesia.

T. brucei.—According to SINCLAIR (1927) this parasite was first found in donkeys by BEVAN in 1905, but BEVAN did not make this clear in papers published in 1910 and 1912.

* It appears to be clear from BRUCE'S report that he was aware that the trypanosome sent to England in the dog was more virulent for horses and dogs than cattle. [Ed.]

(K 3509) Wt P20/262 700 9/28 H & Sp Gp 52

T. congolense.—Was also first recognized by BEVAN in 1909.

T. vivax.—Was seen by BEVAN in 1913, and *T. caprae* in a goat. (SINCLAIR, 1927).

Mozambique.

T. brucei.—BOTELHO (1927) states that *T. brucei* was first recorded by SANT' ANNA in 1908.

T. congolense was recorded by THEILER in 1909. *T. vivax* was recognized by Curson in 1925. JOWETT first saw *T. vivax* in Mozambique in 1910, but failed to identify it as he was dealing with a mixed *congolense-vivax* infection.

CURSON (H. H.). **Meteorological Conditions and the Seasonal Prevalence of Nagana in Zululand.**—Reprint from *S. African Jl. of Sci.* 1927. Dec. Vol. 24. pp. 377–381.

The author gives the general impression regarding the prevalence of nagana by quoting HUTYRA and MAREK 1922: "In accordance with the part played by glossina, the disease (nagana) prevails, usually in moist low-lying areas, in the warm time of the year during the wet season. Domesticated animals are infected chiefly during the day while in the vicinity of swamps, pools, ditches and rivers."

The object of this paper is to point out that although stock may be bitten by glossinae during the wet season, in Zululand the disease manifests itself chiefly during the dry season.

During 1921–23 the author recorded observations regarding rainfall, temperature, humidity, sunshine, barometric pressure, cloud, etc.

There are three topographical regions in Zululand—Lowlands, Midlands, and Highlands. The latter are free from glossina as they are free from bush. The main factor in the seasonal occurrence of nagana is the deterioration of pasture, which occurs during the dry season. The prevalence of the disease is influenced not so much by the total annual rainfall as by the monthly records.

In Zululand the wet period is from October to March, and the dry season April to September. The further from the coast the greater the rainfall during the wet season. Rainfall, temperature and humidity are interdependent, and records show that most of the cases of nagana are diagnosed during the period April to September. The disease disappears after the onset of the spring rains (i.e., October). This marks the improvements in the pastures, particularly as regards their nutritional value.

SCHWETZ (J.). Notes sur les trypanosomiases animales du Haut-Katanga. [**The Animal Trypanosomiases of Upper Katanga.**]—*Ann. Soc. Belge de Méd. Trop.* 1927. Nov. Vol. 7. No. 2. pp. 135–145. [2 refs.]

During 1925 and 1926 there was no case of trypanosomiasis encountered in animals in the neighbourhood of Elizabethville, and this was no doubt due to the disappearance of tsetse flies, and particularly of *G. morsitans.* Outbreaks, however, occurred at some distance (85 kilometres or more) from the capital.

In two instances *T. congolense* was found. Neither the examinations of the herds, nor the treatment (with tartar emetic and atoxyl) were carried out in a systematic manner, and consequently the records are

BRITISH MUSEUM 25 SEP 28

not given. The reasons for this were, lack of time and personnel, and distance from headquarters.

Certain points, however, may be observed. In the first place, there appears to be a marked difference in the resistance offered by indigenous cattle to that offered by pedigree animals.

With one or two exceptions trypanosomes were always scantily present in both gland juice and the peripheral blood. Consequently there is no doubt that some animals which were in reality infected escaped detection.

Tsetse were very rare in the areas in which the outbreaks occurred, but *G. palpalis* was found in one, and *G. morsitans* in the other. There was possibly also direct transmission by Stomoxys and Tabanus. Treatment, as has been said, was carried out very irregularly, but it is noted that only one-quarter of the animals survived.

T. theileri was found in a number of blood smears from these animals.

Examination of blood smears of a number of wild animals has failed to reveal a single trypanosome in any of them.

WALRAVENS (P.), VAN SACEGHEM (R.), NOKERMAN (E.) & MISSAL (F.). Contribution à l'étude du *Trypanosoma rodhaini*. [**Study of** *Trypanosoma rodhaini*.]—*Ann. Soc. Belge de Méd. Trop.* 1927. Nov. Vol. 7. No. 2. pp. 171–173.

The authors describe cases of trypanosomiasis in two pigs due to the parasite which they have named *T. rodhaini*.

The symptoms presented were dullness, loss of appetite, temperature about 40° C., constipation and weakness of the hind legs. Respiration was laboured.

Actively motile trypanosomes were found in the blood.

The animal died about three weeks after it was seen to be ill.

At the post-mortem examination the precrural gland was found to be enlarged and oedematous; there was pleural effusion and evidence of chronic pleurisy. The liver was degenerated. The stomach showed intense inflammation and the spleen was enlarged; there was intense lobar pneumonia, with encapsuled abscesses. A pig, the blood of which was examined four times without trypanosomes being discovered, was inoculated with blood from the above animal. Trypanosomes appeared on the fourth day and death took place a week later.

At the post-mortem there was found exudate of blood in the muscular coat of the stomach round the pylorus. The liver was enlarged and there was slight but diffuse inflammation of the caecum and large intestine.

A rabbit, a guineapig, and an ox inoculated with blood, failed to become infected.

A cercopitheque monkey inoculated with blood from the naturally infected pig, was found to be infected on the 5th day, but presented no symptoms. A month later symptoms of extreme depression developed and death occurred a fortnight later.

An excess of pericardial fluid was the only lesion found.

Nothing is known regarding the method of transmission, but the authors are certain that it can take place in the absence of glossina.

The authors are of the opinion, which is contrary to that held by HORNBY, that *T. rodhaini* cannot be confused with *T. uniforme*, Bruce.

Apart from morphological differences the trypanosome is not pathogenic for cattle, whereas *T. uniforme* is, and the latter has not been shown to be pathogenic for the monkey.

KELSER (R. A.). **Transmission of Surra among Animals of the Equine Species.**—*Philippine Jl. Sci.* 1927. Oct. Vol. 34. No. 2. pp. 115–141. With 2 plates.

The author briefly reviews the literature regarding the transmission of surra and then details experiments in which *Stomoxys calcitrans* (laboratory bred), *Lyperosia exigua* (laboratory bred), *Tabanus striatus*, Mosquitoes (*Aëdes aegypti*), Ticks (*Boophilus australis* and *Dermacentor reticulatus*) were used.

The fullest work was done with *T. striatus*, as a natural outbreak occurred among army horses near Manilla, and full details of their movements, contacts, etc. were obtainable.

For the detection of carriers among carabaos, Kelser used the complement-fixation test, using an antigen prepared in the manner described by WATSON for the diagnosis of dourine.

The author concludes that in the Philippines surra is mechanically transmitted by *T. striatus* to horses, but the possibility is not denied that there may be a cyclical transmission among animals which may act as reservoirs for the virus.

When a horse becomes infected the disease is spread to others by mechanical infection.

COLLIER (W. A.). Sind Trypanosomen filterpassierbar? [**Are Trypanosomes Filterable?**]—*Deut. Tierärzt. Wochenschr.* 1928. May 26. Vol. 36. No. 21. pp. 363–364.

The author finds no evidence that *T. equinum* either in blood or organ emulsion are capable of passing through Seitz filters.

DAVIS (L. J.) & BROWN (H. C.). **The Adhesion Phenomenon, a Specific Serological Reaction occurring in Trypanosomiasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1927. Aug. 31. Vol. 21. No. 2. pp. 113–124. [16 refs.]

In 1917 RIECKENBERG working with *T. brucei* showed that the blood of rats which had recovered from an infection or had been cured caused masses of blood platelets to become adherent to trypanosomes *in vitro*. He found that the reaction was specific, not only for the species of trypanosome, but also for certain strains employed. He was able to differentiate starting and relapsing strains.

KRITSCHEWSKI and TSCHERIKOWER (1925) using *T. equiperdum* found that the specific character of the reaction did not reside in the platelets. They considered that the reaction depended upon a specific principle in the fibrinogen (thrombocytobarin) as the reaction took place with plasma and not with serum. The antibody is thermostable, and the reaction requires the presence of complement.

These authors later found (1926) that the antibody could be produced by dead trypanosomes, and that immune plasma could be diluted to a considerable extent without weakening the reaction. They could not get the reaction with serum expressed from blood clot, but they obtained it with serum from defibrinated blood and with citrated plasma.

Krautz worked with *Treponema duttoni* and found that the rôle played by the platelets was mechanical and that bacteria would serve as indicators equally well. Serum from clotted blood gave a definite reaction with this organism.

Yakimoff (W. L.), Amanschuloff, Arbuzoff, Schuravleff, & Chernomorskoff. Versuch der prophylaktischen Anwendung von Naganol (Bayer 205) bei Trypanosomose der Kamele. [**The Use of Naganol as a Prophylactic in Camel Trypanosomiasis.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1927. Nov. Vol. 31. No. 11. pp. 536–541.

Examination of the blood of some 11,000 camels in the Ural (since 1923) has shown that on an average 25 per cent. are infected with trypanosomiasis and that in some districts the percentage is as high as 40.

Originally the disease occurred along the Ural River only, but of recent years it has spread to other districts.

Treatment of infected camels with naganol has not prevented the spread of the disease. The prophylactic value of naganol was tested on four sets of premises where the natural conditions varied. In each case some of the camels were injected with naganol and an approximately equal or a rather smaller number were kept as controls. The dose used ranged from 5 to 10 grammes and it was injected either subcutaneously or intravenously. After the injection of the drugs the camels were allowed to mix with others in the district. Examination of over 500 of these animals showed that about 10 per cent. were infected. In all, 53 animals were treated, and 33 were kept as controls.

Subsequently the camels were examined at intervals, and the conclusion was drawn that naganol protects for about 3 months.

A dose of 6 grammes appears to be effective.

Moscкkowski (Sch.). Zur Frage des Wirkungsmechanismus von Germanin (Bayer 205) auf Trypanosomen. [**The Mechanism of the Action of Bayer 205 on Trypanosomes.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1927. Nov. Vol. 31. No. 11. pp. 541–552. [13 refs.]

The experiments were carried out with *T. brucei* and the trypanosome of the camel disease Su-auru.

The first series of experiments was designed to discover whether the action of 205 is such that it hinders the process of division of the trypanosomes.

Blood smears were examined at intervals before and after treatment of guineapigs and mice, and 500 trypanosomes were examined. These were grouped according to the appearances they presented into ten groups, (1) normal trypanosomes, (2) double blepharoplasts, (3) 2 nuclei, (4) 2 nuclei, 2 blepharoplasts, (5) twin parasites, (6) almost completely divided, (7) triple parasite, (8) 3 nuclei and 3 blepharoplasts, (9) parasite without blepharoplasts, (10) bizarre forms.

Tabular statements show the results obtained with 9 guineapigs. There is no evidence of an increase in the percentage of dividing forms after treatment. A small series of experiments was carried out to test the view which has been expressed by Mayer & Zeiss and others,

that trypanosomes which are present on the day following treatment have lost their virulence. No evidence confirming this view was obtained. Possibly it is a matter of dosage.

In connexion with the trypanosome of Su-auru experiments were carried out to test the effect of " Bayer 205 " *in vitro.*

In a concentration of 1 per 1,000 the drug was found to be responsible for a prolongation of the period of incubation, the exposure to the drug lasting half an hour.

There appeared to be little or no difference between the amounts required to sterilize *in vitro* and *in vivo*, as the dose necessary to sterilize the blood of infected guinea pigs was about $\frac{1}{3000}$ of the animal's weight.

If a sufficiently large dose be not employed for the treatment of infected guineapigs the acute phase of the disease is survived and it passes into a chronic form, death taking place, often without parasites being discoverable in the blood, with general symptoms of cachexia and paralysis.

VAN HOOF (L.). Therapeutique de la maladie du sommeil et des trypanosomiases animales africaines. [**The Therapeutics of Sleeping Sickness and Trypanosomiasis of Animals in Africa.**]—*Bull. Agric. Congo Belge.* 1927. Sept. Vol. 18. No. 3. pp. 376–416.

This paper is in the nature of a review of the drugs which have been tested in the treatment of human and animal trypanosomiases.

THEODOR (Oskar). **On the Occurrence of a Non-Pathogenic Trypanosome in the Goat and its Transmission by** *Lipoptena caprina* **Austen. Preliminary Note.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Mar. 31. Vol. 21. No. 6. pp. 489–490.

The parasite was discovered by cultivating goat's blood in Myajima's blood broth, with dextrose added, but originally the question as to whether goats harboured a trypanosome in their blood arose on account of the discovery of crithidia in the gut of *Lipoptena caprina*—the Hippoboscid living on goats.

Cultures were positive after 7 days' incubation, and the flagellates measured 20 μ to 45 μ by 2 μ to 4 μ. Only a few were trypanosomes, the majority being crithidia with well developed undulating membranes.

The relationship between the flagellates in the insects and in the goats was established by using laboratory bred flies, and also flies raised from pupae of wild flies. In both naturally infected flies and in flies infected on goats, the flagellates were found in the lower third of the mid-gut above the pyloric valve. In exceptionally heavily infected flies, the whole gut was involved up to its narrow anterior part. No parasites were found in the mouth or oesophagus. The organisms were in crithidial form and ranged from 11 to 34 μ in length, and they were attached by their flagellar end.

In the hind gut free and attached forms were found. The latter were short pyriform bodies 4 to 7 μ in length.

Two young goats which gave negative culture during one month's observation, were fed on an emulsion of wild infected flies. Eleven days later blood culture of one of these yielded a positive result.

PARROT (L.), DONATIEN (A.) & LESTOQUARD (F.). Notes expérimentales sur le bouton d'Orient et sur la leishmaniose canine viscérale. [**Experimental Notes on Oriental Sore and Canine Visceral Leishmaniasis.**]—*Arch. Inst. Pasteur d'Algérie.* 1927. June. Vol. 5. No. 2. pp. 120–130. With 9 figs. on 4 plates.

The greater part of this paper deals with experiments in connexion with the transmission of oriental sore to macacus, attempts to vaccinate macacus against the parasite and a study of the immunity conferred by a first attack of leishmaniasis. The last and shortest section of the paper describes experiments in which the virus of cutaneous leishmaniasis and that of visceral leishmaniasis of the dog are compared. In the experiments with monkeys the infective material has been obtained from mice inoculated intratesticularly, and the monkeys have been inoculated intradermally on the forehead. Proceeding in this way, eleven monkeys have been infected without difficulty.

The period of incubation ranged from 7 to 17 days, and the lesion persisted for two to 5½ months. The same series of changes was observed in every case. The lesion first developed as a papule, and then became converted into a nodule about as large as a pea. This was not adherent to the subjacent tissues. Desquamation and crust formation then occurred at the surface. The incrustation covered a round or oval ulcer with raised margins. Subsequently cicatrisation occurred under the scab.

In one instance there was slight extension of the lesion with the formation of secondary nodules.

In experiments designed to confer immunity it was found that the subcutaneous injection of virus killed by heat at 56° C. for half-an-hour, was quite useless, and similar results followed the intradermal inoculation of killed virus.

Five monkeys were used in experiments to test whether recovery from an experimentally produced infection left any immunity. Two which had recovered a month previously failed to become infected when re-inoculated. Two which had recovered one month and four months respectively developed abortive lesions, and one which had recovered two months previously, developed normal lesions when re-inoculated.

Three monkeys were inoculated intradermally with virus from visceral lesions from dogs, and the result was the development of a cutaneous lesion. This, however, did not progress to ulceration as in the case of lesions produced by virus of human origin.

Cross immunity tests indicated that the canine virus immunizes to some extent against the human virus, the second inoculation leading to the development of an abortive lesion only. A previous attack of cutaneous leishmaniasis was found not to immunize against a subsequent inoculation with canine virus.

HEGNER (Robert) & RATCLIFFE (Herbert.). **Trichomonads from the Mouth of the Dog.**—*Jl. Parasit.* 1927. Sept. Vol. 14. No. 1. pp. 51–53. With 1 text fig. [1 ref.]

The authors describe and figure a Trichomonad found in the mouths of 22 out of 23 dogs, at the laboratory kennels. The animals were kept in separate cages, but during cleaning of the cages they were allowed to come into contact with each other. It is suggested that the

parasite was spread in this way. Twenty specimens from each of three dogs were examined and these showed no significant differences. The organism appears to be distinct from that occurring in man, and the name *Trichomonas canistomae* is suggested.

SERGENT (Edm.), DONATIEN (A), PARROT (L.), LESTOQUARD (F.) & PLANTUREUX (E.). Etudes expérimentales sur les piroplasmoses bovines d'Algérie. [**Experimental Investigations of the Bovine Piroplasmoses of Algeria.**]—*Ann. Inst. Pasteur.* 1927. July. Vol. 41. No. 7. pp. 721–784. With 23 figs.

In a paper which appeared in the Annales of the Pasteur Institute in 1924, the authors published the results of their first systematic investigations of the bovine piroplasmoses occurring in Algeria. The conclusion arrived at was that five types of disease occur, namely :—

(1) True piroplasmosis due to *P. bigeminum* ; (2) Babesiellosis caused by *B. berbera*, n. sp. ; (3) Anaplasmosis caused by *A. marginale* ; (4) Theileriasis due to *T. dispar*, n. sp. ; and (5) Infection with *Gonderia mutans*. The last of these was held to be non-pathogenic.

Typically the first three of these are characterized by an acute primary attack and a prolonged stage of chronic infection during which the animals are in a " premunized " condition. Theileriasis is characterized by an acute attack which confers a true immunity, and by complete recovery. Infection with *Gonderia* generally leads to a chronic afebrile condition, and involves neither immunity nor premunition.

The authors have formed the opinion that although the method requires perfecting, vaccination against the piroplasmosis has been tested on a sufficiently large scale to warrant its application.

I. Piroplasmosis due to *P. bigeminum*.—The authors confirm their previous finding that they can isolate this organism by rapid animal passage, e.g., five passages within 3 weeks. They also find that intravenous inoculation in series exalts the virulence, while subcutaneous inoculation leads to attenuation.

Trypanblue is the drug *par excellence* for the treatment of the condition, but the classical dose of 1 g. per 100 kg. body-weight may cause alarming symptoms. These are in proportion to the number of parasites present and the size of the dose, and are apparently due to the liberation of toxin. It is therefore inadvisable to push dosage to a maximum, but to give doses which will check multiplication to a degree sufficient to allow the animal to make a recovery without attempting to produce complete destruction of the parasites. The authors find that much smaller doses effect this. For animals weighing from 200–300 kg., 10 to 20 centigrammes of the drug are sufficient to control the severe symptoms. Further, intravenous injections of such doses cause far less staining in the tissues. Finally, the administration of the smaller doses is much simpler as the quantity of solvent is only about 20 cc. and a syringe can be used.

The condition of premunization lasts from about 15 to 22 months, and the resistance is very marked.

Cross immunity tests show that strains of *P. bigeminum* from different parts of Northern Africa protect against each other.

The production of immunity by natural infection has led to the investigation of methods for immunization by intervention.

It is the authors' experience, based upon thousands of observations, that great risk attaches to the immunization of animals with blood taken from an infected animal during the acute phases of infection, or even up to three months after the acute stage since a severe attack may be set up. The reaction obtained is satisfactory if the blood be drawn from the infected animal eight months after the acute attack. If an interval of 20 months has elapsed the virus may not be present in the blood in sufficient amount to produce immunity with certainty. If the reaction which occurred when the virus producer became infected was a weak one, the question of the interval elapsing between attack and the withdrawal of blood for immunizing purposes is of less importance. In this connexion it is noted that trypanblue is a valuable aid to checking the severity of the attack of the disease, so that one may have on hand, so to speak, virus producers in which the disease was kept in check to the requisite degree by means of the drug.

The subcutaneous path is that selected for the injections. By other routes immunity may be established, but they are open to objections of a practical nature.

By experiment it has been found that a suitable dose lies between 1 and 10 cc.

II. Babesiellosis.—This disease, it is generally agreed, cannot be controlled by the use of trypanblue; the drug is in fact without effect upon the parasite.

Conditions regarding the production of immunity are parallel with those obtaining in connexion with *P. bigeminum*, and recovery from an attack leaves a durable immunity.

For vaccination purposes blood should be withdrawn from the donor three or four months after the attack. A precaution must be taken in drawing blood for vaccination purposes. It is well known that Babesiella may be present in large numbers in the organs, and if a large amount of blood be withdrawn this may lead to an increase in the number of parasites in the blood and in consequence in the immunizing dose.

Piroplasma bigeminum and *Babesiella berbera* retain their vitality outside the body in citrated blood for several days. Thus vaccine blood can be sent out from laboratories for use in the field.

III. *Anaplasma marginale.*—This organism can be obtained in a state of purity from blood containing other protozoa by passage through the sheep as indicated by LIGNIÈRES. The authors have however, encountered cases of pure anaplasmosis in bovines in Algeria.

The period of incubation in anaplasmosis may vary in experimental cases. In one instance of an animal inoculated with ·2 cc. of blood taken from a chronic case the period was 80 days. As a rule when an acute attack of anaplasmosis occurs during an acute attack of one of the other piroplasmoses the latter disappear from the blood and reappear when the acute stage of the anaplasmosis is over.

It has not been found possible to transmit anaplasmosis to either the donkey or the goat, nor does the virus survive in them. In a few cases sheep inoculated with anaplasma have retained the parasite in their blood for a short time (up to two months).

On the grounds of experimental results which the authors describe, they conclude that the Algerian strain of anaplasma is identical with the Argentine strain.

So far no satisfactory treatment of anaplasmosis has been discovered. An attack confers immunity, or, as the authors describe it,

" premunizes." A re-inoculation may cause a multiplication of the parasites in the blood, but there is no fever or systemic disturbance. The " premunized " state lasts at least 21 months.

Contrary to what is the case in piroplasmosis and babesiellosis, it is not always a certain method of immunizing to inject an animal with blood from a chronic case. The inoculation may fail to cause any infection. The authors find that the severity of an attack of anaplasmosis produced experimentally depends upon the stage at which the parasite is in the blood used. The sooner the blood is taken after inoculation, i.e., during the period of incubation, the less severe the reaction in the animal inoculated. Further the severity of the attack is influenced by the period during which the virus is stored before use.

The authors consider that the best time at which to take blood for premunization is the 5th or 6th day after the donor has been inoculated. At a temperature of 12–21° C. the virus retains its vitality for about 3 days outside the body. It can thus be despatched from laboratories for use in the field.

A few experiments have been carried out in which the " vaccine " blood was exposed to a solution of methylene blue for varying periods prior to use. While some information was obtained that the effect was to reduce the virulence of the blood the results were not constant.

IV. Theileriasis.—The authors have succeeded in isolating *T. dispar* both by rapid passage *in vivo* and by the use of trypanblue when it was associated with *P. bigeminum*. The purity of the strain is tested by re-inoculating with other piroplasms after recovery. The test virus must be taken as nearly as possible at the acute stage of infection.

In their original account of *T. dispar* the authors stated that the infection closely resembled that due to *T. parva* in that the immunity conferred was a complete one and that the parasite disappeared completely from the immune animal's body. They now change their view in that connexion. They believe that the virus may persist for months in the bodies of infected animals either before or after an acute attack without causing any clinical manifestation. They have come to the conclusion that the resistance offered by recovered animals is dependent upon a condition of chronic infection. In their recent experiments the authors found that the period of incubation varied from 12 days to 13 months, and that it was inversely proportional to the amount of virus used. Their description of the evolution of experimental theileriasis therefore requires emending.

If the virus be taken during crisis the attack resulting from inoculation with it is an acute one, and the period of incubation varies from 12 to 24 days. This result is so constant that the authors suggest that virus taken at this stage should be called " fixed virus." There are, however, very occasional exceptions to this in which the attack resulting from inoculation with blood taken at the onset of the disease is delayed in its development. Conservation of the " fixed virus " for periods ranging up to 48 hours before using it for inoculation causes prolongation of the period of incubation.

Inoculation with blood taken during the incubation period or during the chronic phase which follows the primary attack causes infection with, as a rule, a very long period of incubation.

Experiments show that the virus persists up to four months after an acute attack. If the blood be taken for inoculation of other animals during either the incubation period or the post-febrile chronic stage, the virus may remain " latent " in the animals and produce an

acute attack after a period of incubation which is generally prolonged. It may be as long as 13 months. The authors state that these long periods are not to be explained upon the supposition that the attacks are actually due to infection by means of ticks accidentally introduced.

No relapse has ever been observed among the more than 500 animals which have recovered from theileriasis.

Puncture of liver, spleen and lymphatic glands during life and the examination of smears from the same organs after death show that blue bodies occur more frequently in the liver than in the lymphatic glands, and rather more frequently in the lymphatic glands than in the spleen. But in animals inoculated intravenously the bodies appear sooner and in greater numbers in the spleen than in the liver.

The detection of blue bodies in the peripheral circulation is characteristic of the acute stage of the disease, and indicates a probability that the attack will be a very severe and possibly fatal one. As a general rule "blue bodies" are discoverable in smears from organs during the febrile period only; they are absent or extremely difficult to find when the acute stage has passed.

Intracorpuscular forms are always found in severe attacks of theileriasis, but they may be absent in mild cases even though blue bodies are discoverable in smears from the organs, and the authors believe that the febrile attack is due to the multiplication of "agamonts" and the formation of "gamonts;" blue-bodies being in fact the essential pathogenic element in theileriasis.

Cases of theileriasis occur in which there is no apparent disturbance of health. Young bovine animals may have a high temperature, and parasites may be numerously present in their blood, and yet they appear to be in good health. It is quite certain that during the hot weather the actual number of cases of theileriasis is larger than an ordinary clinical examination reveals. Such cases are held to be responsible for the sudden deaths which occur not infrequently. Abortion is a common complication.

In cases of pure theileriasis haemoglobinuria, without haematuria, may occur.

Sometimes embolism of vessels by parasites leads to the production of areas of dry gangrene of the skin or of the eyes. The authors figure a case of the latter lesion. It has been noted that when the blood does not show a reaction—the appearance of anisocytosis punctate basophilia, nucleated red cells, etc.—the prognosis is bad.

A case of congenital theileriasis has been seen in a calf.

Nothing that is of any value for the treatment of the disease has, as yet, been found.

The authors give their reasons for believing that *Theileria dispar* is distinct from both *Gonderia mutans* and from *Theileria parva*.

It was thought at first that an attack of theileriasis due to *T. dispar* produced complete immunity, but further experiments lead the authors to conclude that this is not so, and that slight attacks may occur after re-inoculation. The chances of a reaction to second inoculation increase with the duration of the interval between the first and second inoculation. No reaction has been observed when that interval is less than four months, and it is very remarkable that far more second reactions have been produced by subcutaneous inoculation than by any other route. Provided the strain of virus used for the second inoculation is a virulent one, the dose does not appear to be of

any importance. It is particularly noted, however, that not all strains appear to be capable of setting up a second reaction.

It appears to be possible to establish a state of resistance by inoculating with a strain of low virulence. No success has attended efforts to attenuate viruses, and various attempts to modify the virus for immunizing purposes have not met with success.

SERGENT (Edm.), DONATIEN (A.), PARROT (L.), LESTOQUARD (F.) & PLANTUREUX (E.). Les theilérioses bovines. Etude comparative de *Theileria parva* de l'Afrique du sud et de *Theileria dispar* de l'Afrique du nord. [**The Bovine Theileriases. A Comparative Study of** *T. parva* **of South Africa and** *T. dispar* **of North Africa.**] *Arch. Inst. Pasteur d'Algérie.* 1927. June. Vol. 5. No. 2. pp. 161–187. With 5 figs.

This paper has appeared in a somewhat condensed form in the *Annales de l'Institut Pasteur*, and is summarized above.

THEILER (A.) & DU TOIT (P. J.). Theiléríose sud-africaine expérimentale transmise par le sang. [**Experimental South African Theileriasis transmitted by Blood.**]—*Bull. Soc. Path. Exot.* 1928. Feb. Vol. 21. No. 2. pp. 121–132.

The authors received from SERGENT, prior to their publication, a copy of his reports regarding the experimental transmission of theileriasis by inoculation with blood.

In this paper Theiler and du Toit report the results of the repetition of certain experiments carried out by SERGENT and his collaborators. These include the following :—

1. Intrajugular inoculation.
2. Subcutaneous inoculation.
3. Intraganglionic inoculation.
4. Intradermal inoculation.
5. Intraperitoneal, intraganglionic and intradermal inoculation.
6. Intraperitoneal and intradermal inoculation.
7. Subcutaneous and intradermal inoculations.

SERGENT used 12 bovines in his experiments, and the result was positive in three instances only. In these cases the animals were inoculated by two or three paths.

Theiler and du Toit, considering the Northern African animals as being in all probability more susceptible than those of South Africa decided to use the same doses as those used by SERGENT, but to employ a larger number of animals for each test.

The history of the donors of blood for the experiments is first given, and then follow the details of the experiments.

Of four animals inoculated intraperitoneally, one died of East Coast Fever, one gave a doubtful reaction, and two survived. Three animals inoculated with blood taken on the 6th, 9th and 13th days were inoculated subcutaneously, intradermally, and into the glands.

None of these reacted. A heifer inoculated with blood taken on the 16th day had a temporary febrile reaction, the nature of which was not determined.

A heifer inoculated with the blood used in the first experiment contracted the disease and died.

Five animals were given transfusions of blood of 1,000 and 2,000 cc. and one was given 100 cc. from different donors. None contracted the infection.

Of seven animals inoculated subcutaneously with 250 cc. of blood, one only gave a positive reaction.

Ten animals were given intradermal inoculations of doses ranging from 2·5 to 10 cc. One contracted an infection which terminated fatally, which may have been East Coast Fever.

Four animals were inoculated subcutaneously, intraperitoneally, intradermally, and into the glands with blood taken on the 6th, 9th, 13th and 16th days. The last of these yielded a positive result after a period of incubation of 15 days; the fever lasted 11 days. Ten animals were inoculated subcutaneously and intradermally. Blood taken on on the 9th and 11th days gave negative results. Blood taken on the 6th and 15th days gave positive results. The animal inoculated with 6th day blood died and the other (15th day blood) recovered.

Of two animals inoculated in the same manner with 12th day blood of a different donor one gave a doubtful reaction and recovered, while the other gave a definitely positive reaction and was killed.

Four were inoculated with 10th day blood of another donor, and all gave positive reactions and one died.

In all, 48 animals were used, and of these 11 reacted. Five of the reactors died, five recovered and one was killed. There was one doubtful reaction among the remaining 37.

The method of inoculation which yielded the greatest proportion of successes was subcutaneous and intradermal. With this method infection occurred in 70 per cent. of the test animals.

It is suggested by the authors that this result may have been connected with the particular blood used because it gave positive reactions in every instance in which it was used even when the inoculation was a simple subcutaneous one. It would appear then that the controlling factor in the experiments was the blood used for inoculation, and in this case the blood was from an animal which had itself been infected by subcutaneous inoculation.

In the experiments in Northern Africa with a smaller number of animals success was obtained in 25 per cent. of cases, and the disease produced was less severe.

Dixon (R. W.). **Enquiry and Report into Conditions affecting African Coast Fever.**—*Rhodesian Agric. Jl.* 1928. May. Vol. 25. No. 5. pp. 522–536.

The author details a tour undertaken with the Chief Veterinary Surgeon, and gives a survey of the outbreaks that have occurred in the various districts since 1904. He suspects that Coast Fever has existed in two areas (Umtali or Melsetter and Bulawayo with Matodo and Umzingwane) ever since the disease was introduced in 1902, and that these centres have been responsible to a large extent for the spread of the disease to other districts.

He believes that the disease can be eradicated with three -and five-day dipping. The difficulty is to be perfectly certain of the detection of the last case in a district, for on this is calculated the subsequent period of 15 months' quarantine. The author holds that after release from quarantine, with regular and proper 7-day dipping a farm which was not actually free may remain infected for a year or even two.

Every area released from quarantine should be kept under exactly the same supervision as if it were infected for a further period of a year. If supervision is not maintained and a case occurs, it is generally not detected, and it is only the second or third case that is recognized. In the mean time, the infection may have been spread.

Fencing is of little or no practical value when once the disease has been detected. As a preventive measure fencing should go in advance of, and not follow a disease like East Coast Fever. Dixon holds that the Veterinary Staff should not be responsible for the superintendence of the erection of fences.

Slaughter is recommended where no facilities exist for regular dipping, and where outbreaks occur with heavy mortality in remote areas, but it is not practicable as a method of eradication for economic reasons. Dipping should be persisted in until the infection remaining has been reduced to a minimum. It might then be possible to complete eradication by slaughter.

DSCHUNKOWSKY (E.). Einige Bemerkungen ueber "Anaplasma." [**Some Observations regarding Anaplasma.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1927. Dec. Vol. 31. No. 12. pp. 562–573. With 4 text figs.

The author puts forward the view that the name anaplasma is used for structures which are not all of the same kind.

He points out that bodies called Anaplasma have been variously recognized as : (*a*) nuclear remains ; (*b*) actual parasites (anaplasma) ; and (*c*) developmental stages of other parasites (Anaplasma and Theileria).

In the blood corpuscles of animals in a febrile condition, glistening rounded or oval bodies may be found. These the author believes to be parasitic in nature, and states that they can be transmitted to other animals by inoculation. These bodies do not take any stain and the author calls them "Achromatic Luhs bodies" or "Achroma Luhsi."

In tropical theileriasis the gamonts of *T. annulata* may be present in the circulating blood in anaplasma like forms, and they may undergo their schizogonous development. Ring-shaped parasites may therefore be schizonts or sexual forms.

The intracorpuscular parasites may lose their cytoplasm and thus appear as Anaplasma. These may multiply and produce a generation of anaplasmatic forms.

T. annulata loses its cytoplasm very readily.

The author holds that the name *T. annulata* should stand, and that the name *T. mutans* should be dropped as it is a synomym, and its continued use leads to misunderstanding. Similarly it is held that *T. dispar* is not other than *T. annulata*.

CARRÉ (A.). Toxémies parasitaires des Agneaux. Coccidiose aigue et paraplégie enzootique (Giardiose). [**Parasitic Toxaemias of Lambs. Acute Coccidiosis and Enzootic Paraplegia.**]—*Bull. Acad. Vét. de France.* Paris. 1928. Apr. Vol. 1. pp. 109–116.

As a general rule diseases due to animal parasites are chronic in type, but there are exceptions.

Coccidiosis of the sheep is generally described as a chronic condition causing progressive anaemia. It occurs in animals some months at least after weaning. At the post-mortem there are the usual lesions associated with anaemia and general cachexia and in the small intestine, which is alone involved,the localizations of the parasites in the mucous membrane are recognizable with the naked eye as small white spots.

The author describes cases of coccidiosis in lambs only one to two months old, i.e., before they are weaned.

At the commencement of an outbreak among young lambs one or two are generally found dead, without any symptoms having been observed. Careful observation of the flock on the move will reveal the fact that some of the lambs are lagging. Manipulation of the abdomen causes pain. There is no diarrhoea. Respiration is rapid, and the heart beats are " tumultuous." At post-mortem examination the carcase appears normal: there are no serous transudates, the heart and lungs are normal.

The small intestine appears pale in colour, and pink or yellowish in tint; the capillary arborizations are very distinct. On handling the intestine feels very stiff, and when it is divided, the walls are found to be so thickened that the lumen is almost occluded.

The contents are thick and almost pus-like, and have the appearance of digested milk. In reality they are composed exclusively of oocysts and desquamated epithelium. There is always marked albuminuria.

As the outbreak progresses the course of the disease becomes slower, but not less severe, and diarrhoea becomes a marked symptom.

Bacteriological examinations exclude other possible causes of death such as infection by way of the navel or from the intestine.

Under the name of cerebro-spinal meningitis (Savigné & Leblanc) and enzootic paraplegia (Moussu) there has been described a fatal disease of lambs, the nature of which has up to the present remained entirely unknown. For many years the author has carried out bacteriological investigations and has attempted to produce the disease experimentally, but without success.

The condition of the carcase in these cases is exactly the same as that seen in acute coccidiosis.

At the post-mortem examination carried out immediately after slaughter and complete bleeding the findings are as follows: The rectum is distended with gas and contains normal faeces, and the caecum contains a semi-liquid green mass. The duodenum is distended with gas and contains a yellowish-green viscous fluid. The rest of the small intestine appears to be empty, but in reality contains a small amount of yellowish or pink puriform material. If this be examined directly under a high power dry lens it is found to contain immense numbers of Giardia, both motile and encysted.

The symptoms produced by infection with Giardia are different from those caused by coccidia.

Giardia causes symptoms of cerebral and medullary disturbance and death occurs after several days' illness.

The author has never found Giardia in cases of acute or chronic coccidiosis in lambs, but in lambs heavily infested with Giardia he has sometimes found a few coccidia.

In connexion with prophylaxis the author suggests that small vermin should be destroyed if it is shown that these may act as reservoirs.

Certain cresyl compounds (which are not specified) are said to be of value for the treatment of coccidiosis.

SEDDON (H. R.) & CARNE (H. R.). **Incidence of Coccidiosis in Australian Rabbits as determined by Faecal Examinations.**—*Dept. Agric. N.S. Wales Sci. Bull. No. 29.* 1927. July. Vet. Res. Rept. No. 3. pp. 33–41.

As a result of their examinations of wild rabbits the authors conclude that these harbour both *E. stiedae* and *E. perforans*.

In investigating the incidence of the disease the authors examined rabbit faeces from 62 districts—the material in most cases being faeces collected from the neighbourhood of rabbit burrows, and in no case collected from burrows where rabbits had been observed to be ill.

The examination was carried out by the sugar flotation method.

Ninety-two per cent. of the districts furnishing faeces were found to be infected with the disease to some extent, and *E. stiedae* was found in 73 per cent. of these and *E. perforans* in 65 per cent.

CARNE (H. R.). **On the Preservation of Rabbit Faeces for Transmission. Examination as to the Presence of** *Eimeria perforans* **and** *Eimeria stiedae.*—*Dept. Agric. N. S. Wales Sci. Bull. No. 29.* 1927. July. Vet. Res. Rept. No. 3. pp. 43–45.

It has been found by the author that it is difficult to obtain faeces of rabbits in a suitable condition for examination from some districts because desiccation is very destructive to the parasites before they have time to sporulate and thus become more resistant to external conditions.

A number of methods were tried and the most satisfactory was the preservation of the rectum with its faecal contents in 5 per cent. formalin.

KLARENBEEK (A.). Leptospirae (*Spirochaeta Ictero-uraemiae canis*) als Oorzaak van Icterus, Nephritis en Uraemie van den Hond. [**Leptospirae as a Cause of Jaundice, Nephritis and Uraemia in Dogs.**] —*Tijdschr. v. Diergeneesk.* 1928. Mar. 1. Vol. 55. No. 5. pp. 227–235. With 3 text figs. [Author's English abstract.]

The author considers organisms of the leptospira type to be the cause of Stuttgart disease in dogs, the organisms occurring in the kidney tubules and in the urine. An acute leptospira infection of dogs resembling Weil's disease occurs sporadically in young dogs in Holland. Symptoms of an acute toxic jaundice with albuminuria are not always seen.

Agglutination tests indicate that the organism is related to the spirochaete of Weil's disease.

It is suggested that the dog may infect man with Weil's disease.

DISEASES DUE TO METAZOAN PARASITES.

JOHNSON (W. B.) & RAWSON (P. H.). **Use of the Precipitin Test to Determine the Food Supply of Tsetse Flies; a Preliminary Note.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1927. Aug. 31. Vol. 21. No. 2. pp. 135–149. [4 refs.]

The work reported upon in this paper has been greatly handicapped by lack of a laboratory properly equipped, and by the absence of any method of cold storage.

Fowls were used for the production of antisera, using blood from man, baboon, monkey, roan, bushbuck, duiker, oribi, reedbuck, gazelle, kob, sheep, goat, warthog, donkey, jackal, fox, hyaena, serval, civet, bush rat, domestic rat, rodent ("Vorgu") and hedgehog. Many failures were recorded in the earlier experiments on account of inexperience in the handling and treatment of fowls, the use of too large doses of blood, which caused serum shock, and the use of citrated blood instead of serum.

It was found that individual sera varied greatly in their power to produce antisera, and that there were probably idiosyncrasies among the fowls used.

The most satisfactory technique of producing antisera was to start with a small dose (1 cc. intraperitoneally) and then give a series of 6 further doses gradually increasing up to 10 cc., the whole process being spread over about 3 weeks.

A distinction is made between positive and specific reactions by SUTHERLAND and MITREN. A "positive reaction" is a group reaction and a "specific reaction" explains itself.

The present authors aimed rather at the former than the latter.

No satisfactory method of preserving or storing serum was devised, and this was the more regrettable because in a field laboratory contaminations readily occurred during collection and storage. The absence of any cold store increased the difficulties, as at a temperature of 40° C. (the maximum reached in the laboratory) even sterile sera gradually deteriorated. Under field conditions the only satisfactory plan was to use each batch of serum as it was produced.

The technique of the test was as follows:—

The serum to be tested (whole blood dried on filter paper) was dissolved in 1·8 per cent. saline to make roughly a 1-500 dilution, producing a fine froth with small bubbles on shaking. To 0·3 cc. of this in a Dreyer tube was added 0·5 cc. of antiserum, and the resulting haze or precipitate was noted after half-an-hour and 24 hours. As controls serum dilutions alone, and antiserum with saline have been used. The readings were by transmitted light.

The amount of blood in the gut of a wild fly is usually small, as gorged flies are rarely caught in the net. After feeding the fly rapidly extrudes the serum from the blood. The authors have found that the average quantity of 1-500 serum dilution which can be obtained from a single fly gut is about 3 cc. Using 0·3 cc. for each test sufficient is obtained to test against 9 antisera, using one portion as a control. With experimentally fed *Glossina morsitans* the amount of serum obtained after 2, 6, 24 and 54 hours was 28 : 23 : 6 : 1. In experiments in which the faeces of flies were tested only very weak results were obtained with powerful anti-sheep serum after 24 hours.

In order to limit the number of sera against which each blood had to be tested, the bloods were divided into 2 groups according to the size of the erythrocytes as measured from a smear made at the time of dissection of the flies.

Erythrocytes exceeding 6·2 μ come from man, baboon, monkey, horse, donkey, dog, pig, hyaena, fox, jackal, rodents, hedgehog and other small mammals.

The small cell group, i.e., those erythrocytes which measure less than 6·2 μ, includes cattle, sheep, goat, antelopes, and wild cats.

The grouping is rough, and it is recognized that red corpuscles become changed during digestion. Blood of the pig and donkey may fall into

either group, and antisera of such blood should be tested against both groups.

In the first tests 26 *G. tachinoides* and 44 *G. morsitans* containing mammalian blood were examined. Of these 8 from the former and 7 from the latter fell into group I. Six of the samples from *G. tachinoides* and 5 of those from *G. morsitans* were positive to man.

The tests of the second series were not satisfactory as no strong antelope sera were available, but as group reactions were obtainable they were put up against goat, sheep, and serval.

Thirteen samples from *G. tachinoides* and 37 from *G. morsitans* were used. The marked reactions were 7 and 31 respectively, and the slight reactions were 6 in both cases. No negative results were obtained.

At the place where these tests were carried out (Sherifuri) cattle are not available as food for flies, and goats and sheep seldom come into contact with them.

The second series of tests was carried out at Matyoro and here only bloods in Group I were tested with a view to determining the relative frequency of the bloods of man, baboons, and monkeys.

The authors give a short survey of the general conditions of the country where these tests were carried out, and these are such that during the dry season the fly have little opportunity of feeding upon antelope, and it would be expected that of the two species *G. tachinoides* would remain better nourished than *G. morsitans*, which is so largely dependent upon ungulates.

A table shows the condition of *G. tachinoides*, *G. palpalis* and *G. morsitans* in the Matyoro Valley, January to March, 1927, and this furnishes support to this expectation.

It was also found that bloods of Group I were found in an unusually high proportion of cases in *G. tachinoides* and *G. morsitans*. The percentage in the former was twice as large as in the latter.

A table shows the results obtained and it is noted that owing to pressure of field work, the readings were taken at 4 and 24 hours instead of at ½ hour and 24 hours. This increased the amount of group reaction in the early reading.

Species.	No. of Bloods tested.	Positive reaction to :			Negative to man, baboon, monkey.
		Man.	Baboon.	Monkey.	
		Per cent.	Per cent.	Per cent.	Per cent.
G. tachinoides ...	22	6 = 27·3	13 = 59·1	2 = 9·1	1 = 4·5
G. palpalis ...	1	0	(1 = 100)	0	0
G. morsitans ...	21	8 = 38·1	4 = 19·0	0	9 = 42·9

The large proportion of bloods of Group II from *G. morsitans* which proved negative to the man-baboon-monkey group is of interest, and the source of this blood was not discovered.

Horses, donkeys, and dogs do not come into contact with flies in this district.

Baboons were known to be present in the district in large numbers and these served as food supplies for both the species of flies, and they can to some extent replace ungulate blood. The small monkeys appear to be more difficult to feed upon.

It has been found that the blood obtained from flies can be preserved indefinitely when dried on strips of filter paper, and the test is likely to be of real value in determining the food of flies.

Antisera can be prepared and stored in a properly equipped laboratory, and the tests can be carried out there of bloods collected from flies in field tests.

JACK (R. W.). **Ticks infesting Domestic Animals in Southern Rhodesia.** —*Rhodesian Agric. Jl.* 1928. May. Vol. 25. No. 5. pp. 537–556. (To be cont.).

This paper is intended as a handy guide to stockmen and others.

HEYDON (G. M.). **Observations on the Larvae of** *Onchocerca gibsoni* **(Cleland and Johnston) in the Skin of Infected Cattle.**—*Australian Jl. Experim. Biol. & Med. Sci.* 1927. June 16. Vol. 4. Pt. 2. pp. 61–68. With 1 plate. [10 refs.]

The authors record the discovery of larvae resembling the microfilariae of *Onchocerca gibsoni* in the superficial layers of the dermis of cattle having nodules of *Onchocerca gibsoni* in the brisket. It is pointed out that the possibility was not excluded that the animals might also harbour *O. gutturosa* and *O. lienalis*.

The larvae can be obtained by soaking pieces of skin after mincing in normal saline and then centrifuging.

On another occasion pieces of skin were removed at slaughter and small discs were cut from it with a leather punch. These were placed without mincing in saline and, after 24 hours at room temperature, were washed with fresh saline. The whole of the liquid was centrifuged and thick films made of the sediment with the addition of a little serum.

Examinations were made of skin taken from different parts, and larvae were found in the skin taken from practically all parts of the body.

No observations were made regarding the methods of escape of the larvae from the skin during life, but in the cases of pieces of skin immersed in saline it appeared to be probable that escape took place via the cut edges. It is possible that the percentage of cattle with larvae in the skin is greater than that showing nodules. In sections of infected skin larvae were found in the superficial layers of the dermis; the deepest one found was 0·6 mm. below the basal layer of the epidermis.

No direct observations or experiments have been made regarding transmission.

WOODRUFF (H. A.). **Occurrence of** *Onchocerca gibsoni* **(Worm Nodule) in Cattle in Gippsland, Victoria.**—*Australian Jl. Experim. Biol. & Med. Sci.* 1927. Dec. Vol. 4. Pt. 4. p. 271.

The author records the widespread occurrence of the parasite in territory hitherto thought to be free.

So far it has been found along a strip of coast land centering on Foster, and measuring about 60 miles long by 12 in width.

FIELDING (J. W.). **Further Observations on the Life History of the Eye Worm of Poultry.**—*Australian Jl. Experim. Biol. & Med. Sci.* 1927. Dec. Vol. 4. Pt. 4. pp. 273–281. [1 ref.]

Although living larvae have been detected in the oviduct of female worms and also living larvae have been noted up to 25 days in culture, there would appear to be no continuity of larval life under experimental conditions, and it is now generally considered that larvae hatch from eggs in the gut of the cockroach.

A larva was observed emerging two days after the last possible ingestion of eggs by the cockroach, and they have been found in the gut 6 days, and in the body cavity up to 6 days and 9 days after the last infective meal. Seventeen days after the initial feed encapsuled larvae, twice as large as those newly hatched, have been found. Larvae were found to be non-infective 46 days after infective feeding of the insect, but infective 52 days after. The female begins laying eggs 38 days after entering the definitive host. Pigeons can be infected by cockroaches and worms introduced into the eyes of guineapigs can continue their development, but they are incapable of reaching the eye from the alimentary canal.

ROBERT. L'echinococcose. Rôle des Carnassiers dans sa transmission. [**Echinococcus Disease. The Part played by Carnivora in its Transmission.**]—*Rev. Vét. et Jl. Méd. Vét. et Zootech.* 1928. May. Vol. 80. pp. 270–279.

In Morocco practically every ruminant may be said to be infested with this parasite.

It is generally held that the dog and the jackal are the usual hosts of the tape-worm, but it is a point of extreme importance whether or not there may be other hosts.

There is practically no exact information regarding the extent to which dogs in Northern Africa are parasitized by the tape-worm, and only systematic post-mortem examinations can furnish that information, since examination of faeces is valueless. Although the dogs in the towns have less chance of becoming infected than those outside, owing to the system of meat inspection and to destruction of infected organs, it cannot be said that they have no chance of acquiring the parasite because by no means all the invaded organs are seized and destroyed.

The author has examined 85 dogs post-mortem and of these has found 72 harbouring tape-worms. *T. echinococcus* was found only once, and *T. serrata*, *T. coenurus*, and *T. marginata* were each encountered less than 10 times. *Dipylidium caninum* was found on 64 occasions.

The one animal in which *T. echinococcus* was found harboured about a dozen, and these were found attached to the mucous membrane of the small intestine about the middle of its length.

These dogs were all town dogs.

The author asks whether it is not possible that there is a season (towards the beginning of winter) when the chances of infestation are greater—this period being that during which the largest losses occur among animals. He asks whether it is not possible that the chances of infestation are greater in the sheep-raising districts, as the hydatids in this species are more frequently fertile. Nothing is known regarding the conditions under which fertile segments are detached, nor how frequently this occurs.

The author three times attempted to infect dogs experimentally by feeding them respectively on infested liver and lung, and though the dogs were left for 40 and 60 days before they were subjected to post-mortem examination they were not found to harbour the parasite.

He makes the suggestion that man himself may possibly act as a host to the tape-worm, but admits that there is no evidence to support the theory.

The jackal has been held to be a host of the *T. echinococcus*, but, again, there is no evidence to support this view. The author has had the opportunity of making post-mortem examinations on five jackals, but *T. echinococcus* was not found.

One experiment has been carried out in which a jackal was fed with infested organs. The animal was kept for 102 days and was killed 42 days after its last contaminated meal. The tape-worm was not found.

BUGGE (G.). Ueber den Invasionsweg an *Fasciola hepatica* bei der Distomatose der Kinder und Schafe. [**The Path of Invasion of *Fasciola hepatica* in Hepatic Distomatosis in Cattle and Sheep.**]—*Berlin. Tierärzt. Wochenschr.* 1928. Mar. 23. Vol. 44. No. 12. pp. 189–195. With 14 figs. in 1 plate.

Three views have been held regarding the path by which *Fasciola hepatica* reaches the liver, viz.: (*a*) via the bile ducts; (*b*) from the peritoneal cavity direct into the liver; (*c*) via the portal vein.

As the result of his own investigations, the author states that he has been able to find young distomes in organs other than those already reported. He has found them in the liver, in the mesenteric glands of cattle, in minute haemorrhagic centres in the lungs, in the spleen of the sheep, and in the form of small swellings underneath the peritoneum covering the abdominal side of the diaphragm.

In the author's view the occurrence of very small parasites in haemorrhagic centres in various organs indicates that they reach these places via the circulation. Their occurrence in lymph glands without evidence of haemorrhage is an indication that they may also pass by the lymphatics.

DE BLIECK (L.) & BAUDET (E. A. R. F.). Hexachlooraethaan als middel tegen Distomatosis bij het Rund. [**Hexachlorethane for the Treatment of Distomatosis in the Ox.**]—*Tijdschr. v. Diergeneesk.* 1928. May 1. Vol. 55. No. 9. pp. 429–435. [Author's English Summary.]

As carbon tetrachloride sometimes poisons cattle, the authors have carried out experiments with hexachlorethane for the treatment of fluke in cattle. Satisfactory results were obtained. The dose is 10 grams per 25 kg. body weight, and the dose is given in capsules and distributed over four days.

Each morning the animals are given $\frac{1}{4}$ of the dose before any food is given, and all food is withheld for two or three hours afterwards. During treatment oily substances should be avoided.

BACTERIAL DISEASES.

Ross (G. R.). **A Serological Study of Undulant Fever in Southern Rhodesia.**—*Jl. of Hyg.* 1927. Oct. Vol. 26. No. 4. pp. 403–419. [24 refs.]

In surveying the literature regarding the relationship between *Br. abortus* and undulant fever, the author points out that there has been much neglect in testing cases in countries where it appears to be assumed that because there is no great goat population, undulant fever does not exist. It has been assumed that the epidemiology of undulant fever is connected with goats only. He also points out that it does not appeared to have been considered as a possibility that undulant fever may be caused by both *Br. melitensis* and *Br. abortus*, although the epidemiology of the conditions may not be exactly parallel.

Emphasis is laid upon the part played by BEVAN in Rhodesia in first calling attention to the possible danger to man arising from the use of milk from cows affected with contagious abortion. It is generally agreed that on morphological and biological grounds the two organisms cannot be distinguished, but the results obtained with serological tests are rather confusing. This is perhaps partly explained on the grounds that prior to 1924 any organism isolated from a human patient and possessing the morphological and cultural characters of *Br. melitensis* was definitely identified as that organism. It is not impossible that some of these are actually *Br. abortus*. This emphasizes the necessity of a thorough investigation of all type strains of *Br. melitensis*.

The author's own investigations were aimed at confirming the serological differences stated to exist between *Br. melitensis* and *abortus*, and to obtain information regarding the nature of the strains isolated from cases of undulant fever in Rhodesia.

The morphological and cultural characters of the strains used were not investigated beyond ascertaining that they belonged to the Melitensis-abortus group of the Alcaligenes.

Nine strains of organisms were used, including 5 *Br. melitensis*, 3 *Br. abortus*, and 1 *Br. paramelitensis*. The strains included some of English origin and some of South African origin.

By direct agglutination the organisms could be divided into two groups, but such separation was incomplete, because one of the groups included both melitensis and abortus strains, and the second all three strains. To obtain further differentiation the agglutinin-absorption test was used.

By using a number of sets of tubes it was possible to determine: (1) whether the organism was agglutinated or not by unabsorbed serum; (2) whether all agglutinins for the homologue were removed or not by the absorption of the serum with the test organism; (3) whether absorption had been complete and had removed from the serum all agglutinins, if any were present, for the test organism. An additional test with normal rabbit serum was put up to see whether auto-agglutination occurred with any strain.

The results of these tests permitted the formation of two groups of organisms. Group I contained four strains of *Br. melitensis* and two of *Br. abortus*, while Group II contained one *Br. melitensis*, one *paramelitensis*, and one *Br. abortus*.

Investigations were carried out with strains of organisms isolated from cases of undulant fever occurring in Rhodesia. Eight strains were used. These, after a few months' subcultivation, could not be classified in any way upon morphological grounds, although at first subculture most of them had been distinctly bacillary. Their pathogenicity for the guineapig was established, but in no case was the infection fatal; in some of the animals there was found enlargement of the spleen seven months after inoculation : the animals appeared to be quite healthy.

Absorption agglutination tests were carried out with each strain against some of the sera of strains of *Br. melitensis* and *Br. abortus* with which the preliminary tests were made. The reactions of 6 out of the 8 showed that they were characterisitc of those of *Br. abortus*. The remaining two strains did not resemble either typical *Br. abortus* nor *Br. melitensis*, but were found to be identical with *Br. para-abortus*.

These results indicate that *Br. abortus* is an important factor in the causation of Rhodesian undulant fever.

The results obtained in these experiments indicate that a distinction can be made between *Br. melitensis* and *Br. paramelitensis*, and *Br. abortus* and *Br. para-abortus*. The similarities between *Br. melitensis* and *Br. abortus* and between *Br. paramelitensis* and *Br. para-abortus* are greater than those between *Br. melitensis* and *Br. paramelitensis* and between *Br. abortus* and *Br. para-abortus*.

It is suggested that the melitensis-abortus group represent the " S " normal types and the paramelitensis-para-abortus group the " R " mutant types.

McAlpine (James G.) & Slanetz (Charles A.). **Studies on the Metabolism of the Abortus-Melitensis Group. 2. Further Observations on Nitrogen Metabolism.**— *Jl. Infect. Dis.* 1928. Jan. Vol. 42. No. 1. pp. 66–72. With 2 charts in text. [5 refs.]

The authors are able to confirm their finding that bovine strains of *Br. abortus* differs from porcine and human strains of the organism and from *Br. melitensis* in their nitrogen metabolism.

Ten per cent. carbon dioxide stimulates growth of the bovine organism and inhibits the others. This holds good whether plain or glucose-containing media are used.

The bovine strain would appear not to utilize sugar, while the other strains do. The bovine strain gave a slightly decreasing value for non-protein nitrogen throughout incubation, while the others did not, and, in fact, gave slightly increasing values. On the grounds of these experiments it is suggested that the proposed generic name Alcaligenes is incorrect.

The production of ammonia by the bovine strains runs parallel with the incapacity exhibited by these strains of utilizing glucose.

The authors conclude that *Br. abortus* (bovine) can be differentiated from the porcine and human strains, and from *Br. melitensis* by the different amounts of the nitrogenous fractions in culture medium over a 14-day period of incubation. This difference is apparent only in glucose-containing media.

McALPINE (James G.) & SLANETZ (Charles A.). **Studies on the Metabolism of the Abortus-Melitensis Group. 3. Glucose Utilization.** —*Jl. Infect. Dis.* 1928. Jan. Vol. 42. No. 1. pp. 73–78. With 1 chart in text. [5 refs.]

This report elaborates the previous one regarding the ultilization of glucose or otherwise by *Br. abortus* bovine, porcine, and human and by *Br. melitensis.*

It is repeated that in view of the results obtained in their experiments the generic name, Alcaligenes, suggested for this group would be erroneous. There is little doubt that all the types of this group with the exception of *Br. abortus* bovine are able to split sugars, while the exception is not.

Br. melitensis strains do not appear to give such low pH values as *Br. abortus* of porcine and human origin.

Exceptional strains may be encountered among those isolated from bovine sources, and it is not improbable that these infections in bovines have been derived from porcine sources. Porcine strains are more virulent for guineapigs than bovine strains.

It is, further, not improbable that infection in human beings is from porcine sources.

VAN SACEGHEM (R.). L'avortement épizootique des bovidés au Katanga (Congo belge) et son traitement. [**Bovine Abortion in Katanga and its Treatment.**]—*Ann. Soc. Belge. de Méd. Trop.* 1927. Nov. Vol. 7. No. 2. pp. 157–164.

The substance of this paper has appeared elsewhere, and has been dealt with.

CÉSARI (E.). Prophylaxie de la fièvre mediterranéenne. Diagnostic de l'infection melitensique chez les animaux. [**Protection against Mediterranean Fever. The Diagnosis of the Infection in Animals.**] —*Rev. Gén. Méd. Vét.* 1928. Jan. 15. Vol. 37. No. 433. pp. 1–9.

The area in which undulant fever is endemic in France is slowly but surely increasing, and in some parts the disease is a veritable plague. At the same time our knowledge regarding animal carriers of infection becomes more exact, and it is now realized that the goat is not alone to blame.

It is quite clear that the measures hitherto recommended to prevent infection of man are inadequate.

Whatever point of view we take regarding the possibilities of intervention with a view to controlling and preventing infection in man, the important point is diagnosis. The author summarizes the difficulties encountered in the matter of the application of agents designed to give diagnoses.

VAN DEN HODEN (J.). De Abortusbacterie van het Rund (*Bact. abortus infectiosi* Bang) Ziekteverwekker bij den Mench. [**The Bacillus of Bovine Contagious Abortion as a Cause of Disease in Man.**]—*Tijdschr v. Diergeneesk.* 1928. Mar. 1. Vol. 55. No. 5. pp. 209–226. [Author's English Abstract.]

It is important that, in investigating the pathogenicity of the abortion bacillus to man, the work should be carried out at places where undulant fever has occurred.

It is not sufficient to prove the existence of agglutinins in human sera.

A case is cited of a baker in a Dutch village who has been suffering for six months from a disease which clinically resembles undulant fever closely. His serum tested with Bang's bacillus is positive to 1 in 6,400, while with *Br. melitensis* the titre is 1 in 800. Heating the serum for half an hour at 56° C. does not destroy the agglutinin. Absorption tests with *Br. abortus* and *Br. melitensis* positive.

No abortion bacilli have been isolated from either the blood or urine as yet.

The man appears to have become infected through a wound while delivering an infected cow of a dead foetus.

Three of the cows react to the agglutination test.

The man has never been out of Holland, and no goats have been imported into the district. Abortion among goats is unknown there.

ALBISTON (Harold E.). **Infectious Necrotic Hepatitis of Sheep in Victoria. A Braxy-like Sheep Disease.**—*Australian Jl. Experim. Biol. & Med. Sci.* 1927. June. Vol. 4. Pt. 2. pp. 113–123. [4 refs.]

The author describes a condition encountered in sheep in Victoria, closely resembling black disease, described by DODD. Although it is called a braxy-like disease, it is distinct from braxy as seen in Scotland.

The essential lesion of the disease is a focal necrosis of the liver.

In Victoria the disease appears in the late summer and continues until the first heavy winter rains. Apart from lagging behind the flock, there appear to be no symptoms during life.

An anaerobic bacillus can be cultivated from the necrotic liver tissue, but not from elsewhere. This organism bears a close resemblance to *B. oedematiens* (Weinberg).

It has not been found possible to establish immunity artificially. The organism produces a toxin in cultures which reaches its maximum concentration after about eighteen hours' incubation.

TAKASAWA (T.). **Preliminary Report on the Experiment of the Aerobic Culture of the Black-Leg Bacillus and its Protective Value.**—Paper published by the Serum Institute for the Diseases of Domesticated Animals, Tarhoku, Formosa, 1927. (Author's English Summary.)

The following medium is prepared :—

Peptone (Witte)	5 g.
Grape sugar	5 g.
Sodium chloride	0·5 g.
Water	100 cc.

It is a little difficult to understand the author's exact meaning in the further steps in the process of preparation of the medium, and the paragraph is therefore quoted.

"To above media added some quantity of fresh sterilized pieces to chicken liver, and then alkalified it to 0·2 per cent. of natrium carbonicum anhydricum (pH 7·611) ; then the blackleg bacillus inoculated to the above prepared media ; and they cultivated to the incubator within 24–48 hours at temperature of 37° C.

"Next, the above original culture being subcultured on the common agar, they variate to the aerobic, though seldom, one or two colonies out of about 60 tubes of the agar."

Growth is apparently slow at first, but becomes accelerated with repeated sub-cultivation.

The author claims to have cultivated the bacillus of malignant oedema in this way, and is experimenting with tetanus.

Three to five cubic centimetres of an emulsion of the aerobic blackleg bacillus prepared by adding a loopful of agar culture to 5 cc. of normal saline was found to confer immunity after a lapse of two weeks.

The first generation of aerobic culture is fatal to guineapigs, but the third is not.

"The blackleg bacillus which variated to the aerobic of which agar cultivation advanced its generation to a certain degree, enables to revert to the anaerobic in vice versa; at the same time, its virulency can be restored."

Both aerobic and anaerobic types can be isolated from the heart blood of a guineapig killed with the first generation of aerobic cultures.

KUDRJAWZEW (G.) & ROMANOW (D.). Zur Frage der Serodiagnostik bei Milzbrand. [**The Serum Diagnosis of Anthrax.**]—*Ztschr. f. Infektionskr. d. Haustiere.* 1927. Nov. 23. Vol. 32. No. 1. pp. 57–62.

The authors draw attention to the important part that can be played by the precipitin test in the detection of raw materials such as hides that are contaminated by anthrax. But they have experienced a difficulty in preparing an antiserum of high titre. The principal reasons for this appears to be that animals vary greatly in their power to react, and the authors instance cases reported by others of their difficulties in this respect. SCHUTZ and PFEILER succeeded in obtaining a good serum from one rabbit out of thirty immunized.

The authors themselves failed to prepare a satisfactory serum from a horse and two foals, and they subsequently used protein obtained from the bacillus in place of the organism itself. The following is an outline of the technique employed for the preparation of this reagent. Cultures were prepared of Zenkowski anthrax vaccine I on agar, and these were incubated for 12 hours at 37° C. The growth from each culture flask was washed off in 10 cc. normal saline. This was then diluted with 100 cc. of distilled water. The suspension obtained from 10 flasks (1 litre in all) had then added to it 10 cc. of saturated salt solution, and 6 or 7 drops of 50 per cent. acetic acid. The flask was then steamed for 20 to 30 minutes to coagulate the albumen. On cooling, the albumen was collected on filter paper and pressed between filter paper to dry it until it acquired a doughy consistence. It was then rolled into small cylinders 2–3 cm. in length and placed in toluol. In this way it could be preserved for a year or more in good condition. For use 0·02 g. of the albumen was ground up in 2 cc. of normal saline and injected intravenously. Wethers were used and they were given injections at intervals of one to three days for a month. Intravenous and intraperitoneal injections were given.

As precipitinogen extracts were made of various tissues and organs of guineapigs dead of anthrax; fresh spleen, formalin-preserved liver, skin, and extracts of 24-hour cultures of Zenkowski vaccine I were used.

The antiserum was so active that positive results were obtained in less than five minutes.

In November 1926 a foal was immunized with the albumen. The first dose was 0·02 g. in 2 cc. of salt and with intervals of two or three days between injections. This was gradually increased until 0·5 g. in 100 cc. were given. Blood drawn a month after the first injection yielded a serum which gave the reaction with extract of the Zenkowski vaccine and with spleen extract in four minutes.

A second foal was immunized in a similar manner and a very active serum was obtained.

Tests with extracts of putrid organs and tissues yielded quite satisfactory results.

The authors have used the following techniques for the purpose of obtaining extracts of hides suspected of anthrax contamination. The first method was to cut pieces of hide into very small pieces and soak them in normal saline for 15 to 18 hours in the refrigerator, and the second was to heat the hide in saline over boiling water for 5 to 10 minutes, in each case filtering afterwards through an asbestos filter.

CLAUSSEN. Vergleichende Untersuchungen über das Verhalten von Essigsäure und Karbolsäureauszügen beim Milzbrandnachweis an Häuten durch das Präzipitatinsverfahren nach Ascoli. [**A Comparison between Acetic Acid and Carbolic Acid Extracts in the Precipitin Test for the Detection of Anthrax in Hides.**]—*Ztschr. f. Infektionskr. d. Haustiere.* 1928. Feb. Vol. 32. No. 3. pp. 252–261.

The author finds that extracts of skin prepared by soaking the fragments in 0·5 per cent. acetic acid and autoclaving for 10 minutes at 120° C. are not superior to those prepared with 0·5 per cent. carbolic acid in normal saline without autoclaving. The latter are more transparent and are more easily rendered clear.

The reactions given are not specific as they can be obtained with normal hides and normal sera.

STANDFUSZ (R.) & POHL (G.). Disinfektionsversuche an ausländischen Mitzbrandhäuten. [**The Disinfection of Foreign Anthrax-Infected Hides.**]—*Ztschr. f. Infektionskr. d. Haustiere.* 1927. Nov. Vol. 32. No. 1. pp. 23–56.

At a meeting of the Berlin Veterinary Asosciation in February 1927 MÜSSMEIER showed that the great majority of cases of anthrax in Germany were due directly to infected materials of various sorts imported into the country. It is therefore a matter of extreme importance that means should be devised for the disinfection of these materials without lessening their commercial value.

Hides are one of the important vectors of anthrax infection, and their disinfection has been the subject of investigation by a number of authors, but complete success has not as yet been achieved. Three factors have to be taken into consideration. In the first place the method must be successful from the point of view of the disinfection, secondly the hides must not be adversely affected, and in the third place the cost of the process must not be prohibitive.

Details are given by the authors of a number of experiments in which different expedients were resorted to.

In the first series attempts we made to destroy the contamination by heat after the spores contained in the leather had germinated.

Pieces of hide were soaked in water at 37° C. for 24 hours; and the temperature was then raised to 60° C. and maintained at that for 2 hours. After three days at room temperature a part of the liquid was poured off and the remainder was centrifuged with the sediment which had fallen on standing. The sediment after centrifuging was mixed with a small amount of saline, roughly filtered and used for the inoculation of mice. Twenty were used and 13 died of anthrax.

This method was then modified by incubating at 37° C. for 13 hours only and then heating to 70° C. for two hours, these processes being repeated. After being left at room temperature for 4 days the technique described above was followed. Ten mice were used and one died of anthrax.

A sporulating anthrax agar culture was washed off in saline, incubated for 24 hours at 37° C. and then heated to 60° C. for 2 hours. These processes were repeated and the culture was then used for the inoculation of mice. Three out of ten died of anthrax.

When the incubation and heating were repeated three times two out of ten mice died of anthrax.

In the second series of experiments an attempt was made to utilize the antagonism between *Bacillus pyocyaneus* and the anthrax bacillus. This antagonism was first demonstrated by BOUCHARD in 1889, and in the following year BLAGOWATSCHENSKY showed that it was due to the products of metabolism of *B. pyocyaneus.*

In the first of the experiments 8 out of ten mice died of anthrax. In the second, although 9 of the mice died it was not due to anthrax in any instance. The technique in this case was as follows.

The pieces of hide were incubated at 37° C. for 24 hours, and a 24-hour pyocyaneus culture was then added. This was allowed to stand at room temperature for 5 days and then the temperature was raised to 60° C. for two hours. The purpose of this was to kill off the pyocyaneus culture. Subsequently the materials were left to stand for 4 days at room temperature.

The subsequent steps were as before.

The experiment was repeated with a control in which pyocyaneus was not used. In this case all the mice died both in the test and in the control, but in the test three died of anthrax, and in the control 7.

This experiment was repeated three times, but the results failed to reveal any difference between the hide treated with bacillus pyocyaneus and those that were not.

Other experiments embodying the same idea, but differing in details were carried out. None of these furnished any indication that the pyocyaneus method was likely to prove of any value.

Oil of mustard which has been credited with the power of destroying anthrax spores was found by the authors to be ineffective.

A proprietary substance " Glawelin " was tested and it was found to be effective for the destruction of anthrax contamination in 4 to 5 days in 1 to 3 per cent. solution but with this exposure damage was done to the hides. A 5 per cent. solution of commercial sodium sulphide was found to be destructive to cultures of the anthrax bacillus, but it was not certainly destructive for the contaminations present in hides.

The chemically pure salt was tested in 5, 8 and 10 per cent. watery solution on infected hides, and it was found that these solutions were destructive to the organisms in from 8 to 10 days. A large series of experiments supported this conclusion. The disinfection was not

complete in every case, but it was successful in the great majority of them.

Chloramin was found to be inefficient for the disinfection of hides.

POHL (G.). Weitere Versuche zur Frage der Disinfektion milzbrandiger Trockenhäute. [**Further Investigations in Connexion with the Disinfection of Dried Anthrax Hides.**]—*Ztschr. f. Infektionskr. d. Haustiere.* 1928. Apr. 2. Vol. 32. No. 4. pp. 304–337.

The author's experiments have been carried out with the following substances: Chloramine, bleaching powder (25 per cent. active chlorine), commercial sodium sulphide, sulfoliquid, tetralol, bromtetralol, tetratresorcin, hydrochloric acid and salt, soda lye and hydrochloric acid, and perchloride and formic acid.

Details of experiments are given in which silk threads contaminated with anthrax spores and pieces of hide similarly contaminated were treated in various ways with the above substances. The only satisfactory results obtained followed the use of sodium sulphide and the hydrochloric acid and salt process.

Chloramin and bleaching powder effected superficial disinfection, but their action in the deeper parts was very slight.

Commercial sodium sulphide containing 60–62 per cent. Na_2S was used as the chemically pure drug was too expensive. This was found to be soluble in water after it had been reduced to a rough powder. The pH of the solution was 7·6. The 10 per cent. solution used in the experiments was 10 grammes of the commercial product in 100 cc. of water, so that in reality it was only 6 to 6·2 per cent. Na_2S.

Pieces of skin were soaked in the solution for 8 days at room temperature, and were then washed four times with water in the course of two days.

In all, 50 mice were inoculated and although all but 6 died, none of them could be shown to have died from anthrax.

In the experiments in which contaminated silk threads were soaked for 8 days in the 10 per cent. solution, 22 out of 25 mice inoculated died, and in two instances death was due to anthrax. Anthrax bacilli were cultivated in four out of 5 cases from the centrifuge sediment of the water used for washing the threads.

The hydrochloric acid and salt " pickle method " was recommended by SCHATRENFROH in 1911. The mixture contained 2 per cent. hydrochloric acid and 14 to 16 per cent. salt and this was allowed to act for 24 hours at 22° C. Alternatively 1 per cent. hydrochloric acid and 8 per cent. salt were allowed to act for 2–3 hours at 40° C. A number of authors repeated the experiments and confirmed the results, and various modifications of percentage, exposure, and temperature were sugg sted. The question of cost has also been investigated, as this, along with the absence of deleterious effects upon the hides is one of the prime factors in any process used.

Three series of experiments were carried out with officially recommended formulae. In the first of these, 10 per cent. salt and 2 per cent. hydrochloric acid were allowed to act for 40 hours at 20° C. Five out of 25 mice died of anthrax, and none of the others survived.

In the second series the solution was kept at 40° C. and was allowed to act for 9 hours. Three of the mice died of anthrax, 21 of other conditions and one survived.

One per cent. hydrochloric acid in 10 per cent. salt was allowed to act for 15 hours at 40° C. Five of the 25 mice inoculated died of anthrax. The experiments were all carried out with threads soaked in sporulating cultures.

Although there was considerable destruction of the contamination it was in no case complete, and the results of the three processes were practically identical.

SEDDON (H. R.) & CARNE (H. R.). **The Occurrence of** *B. botulinus*, **Type B, in Rabbit Carrion.**—*Dept. Agric. N. S. Wales Sci. Bull. No. 29.* 1927. July. Vet. Res. Rept. No. 3. pp. 22–25.

The authors record an outbreak of botulism which involved the death of five animals in all—2 cows, 2 steers, and an aged horse. These deaths had been spread over a period of some two years.

The farm was in a " bone-chewing " district, and the cows after milking used to eat from a pile of rabbit carcases, of which about 400 had been trapped some twelve months previously.

Cultures were made from some of the rabbits and an organism was isolated which when tested with various antitoxins was identified as *B. botulinus* B.

SCHOENHOLZ (P.). **Surface Colony Types of** *Cl. botulinum* **on Blood Agar.**—*Jl. Infect. Dis.* 1928. Jan. Vol. 42. No. 1. pp. 40–47. With 9 figs. on 1 plate. [5 refs.]

Stock strains of *Cl. botulinum* were plated on 2 per cent. veal infusion agar containing 1 per cent. glucose and 10 per cent. defibrinated sheep blood.

Five different types of surface colonies were obtained and it was found that the strains varied in their haemolytic powers.

SEDDON (H. R.). & BELSCHNER (H. G.). **Bacterial Infection associated with Grass Seed Infestation in Sheep.**—*Dept. Agric. N. S. Wales. Sci. Bull. No. 29.* 1927. July. Vet. Res. Rept. No. 3. pp. 26–30.

The outbreak occurred on a farm of some 8,000 acres carrying 5,400 sheep, and most of the losses occurred among weaners (5 to 8 months old). Lameness was the prominent symptom, and the only lesion constantly found was the presence of an abscess involving the skin and subcutaneous tissues—the largest of these was about the size of a tennis-ball. The smaller lesions were definitely associated with the presence of grass seeds.

Abscesses in the lungs occurred in some cases ; none of these were very large, and none were encapsuled. They appeared to be in reality suppurating centres in areas of croupous pneumonia. There was some amount of pleurisy.

Bacteriological examination appeared to incriminate the Preisz-Nocard bacillus. The authors believe that the dipping to which the sheep were subjected had a harmful influence as the process would have caused seeds which had partly penetrated the skin to swell and thus enlarge the opening in the skin.

LECLAINCHE (E.) & VALLÉE (H.). Sur la Vaccination contre le charbon symptomatique. [**Vaccination against Black Quarter.**]—*Rev. Gén. Méd. Vét.* 1928. Feb. 15. Vol. 37. No. 434. pp. 65–68.

The authors have completely given up filtered cultures for the protective inoculation of animals against blackquarter. They state that in 1900 they pointed out that filtration deprives cultures of the greater part of the soluble active principles. The strong acidity of cultures accentuates the reduction of active substances resulting from filtration. Supercentrifugation, employing a Sharple machine, yields far more active germ free liquids for immunizing purposes. This machine runs at about 50,000 revolutions, and renders the supernatant liquid almost sterile. Complete sterilization can be effected by the addition of small quantities of formalin.

The antigenic properties of such vaccines are immensely improved by using a number of different strains. Formolized whole cultures were shown by the authors in 1925 to be far superior to filtrates.

By using centrifugation followed by the addition of formalin a liquid antigen which can be concentrated is obtained.

DISEASES DUE TO FILTERABLE VIRUSES.

GREENWOOD (M.). **Some Epidemiological Observations on Foot-and-Mouth Disease, with Special Reference to the Recent Experience of Holland.**—*Jl. of Hyg.* 1927. Oct. Vol. 26. No. 4. pp. 465–489. With 1 map.

This paper is the work of a statistical epidemiologist, and its nature is such that it does not lend itself to abstraction. It contains an immense amount of valuable statistical information regarding the prevalence and distribution of foot-and-mouth disease in this country and in Holland.

The author comes to the conclusion that the facts and figures given regarding the occurrence of the disease in Holland over a number of years do not support the conclusion that the slaughter policy has had any effect upon the epidemiological history of the disease. But he says that it is quite a different question as to how far this policy is logically applicable to this country. The two countries are quite differently situated with regard to frontiers.

The author is inclined to think that all outbreaks are not necessarily due to importation of virus. He suggests that carriers may exist and that the importation of non-immunes is as important as the importation (into any centre) of infected animals. The possibility of the occurrence of infection without clinical manifestation with subsequent persistence of virus may be responsible for some outbreaks. In this connexion variations in rapidity of spread and severity of attacks are of importance.

HORNBY (H. E.). **The Distribution of Rinderpest Virus in Infected Blood.**—*Jl. Comp. Path. & Therap.* 1928. Mar. Vol. 41. No. 1. pp. 17–24. [10 refs.]

The author passes in rapid review the opinions that have been expressed regarding the filterability of the rinderpest virus, and discusses

the interpretations placed upon their experiments by the various investigators of the subject. He draws special attention to the importance of the minimal infective dose determination. Hornby's experiments regarding the passage of the virus present in the blood through filters leads him to conclude that the virus does pass but that its concentration in the filtrate is greatly reduced. A large dose of filtrate is therefore necessary to furnish a minimal infective dose.

Experiments in which solutions of acid fuchsin and basic fuchsin were used furnished support to KRAMER's view that positively charged particles are adsorbed by earthenware filters.

Reference is also made to the investigations carried out by OLITSKY and BOEZ regarding the importance of the pH of liquids containing foot-and-mouth disease virus in connexion with filtration.

Hitherto in experiments connected with the filtration of the virus of rinderpest the question of electrical adsorption does not appear to have been considered.

In Hornby's experiments allowance was made for this by diluting blood with neutral and with alkaline buffered solutions.

In the first experiment it was shown that when neutral and alkaline filtrates are used, the filtrate from at least one hundred times the minimal infective dose is avirulent.

Using alkaline filtrate the dose was doubled in the next experiments and it was then found that the filtrate was infective. So that alkaline filtrate from more than two hundred times the minimal infective dose contained the virus in an infecting amount.

A similar result was obtained when the blood was diluted with neutral buffered saline.

Filtration through a Berkefeld filter therefore reduces the virulence of blood in the proportion of about 200 to 1. Since the result was the same whether a neutral or an alkaline medium was used the inference is that the great bulk of the virus is attached to infilterable particles of the blood—namely leucocytes, erythrocytes, or platelets.

With a view to finding out to which of the blood elements the virus is attached diluted blood was filtered through cotton wool. The detailed technique of the operation is described. Counts were then made of the filtrate and of the diluted blood prior to filtration. These experiments were carried out with a number of samples of blood and it was found that while the red corpuscles and platelets were reduced on an average by 15 and 50 per cent. respectively, the leucocytes were reduced to less than 1 per cent. by the filtration.

Since both leucocytes and virus are reduced to approximately the same extent, and since the reaction of the filtrate (whether neutral or alkaline) does not affect the filtrability of the virus it is reasonable to conclude that the virus is attached to the unfilterable leucocytes.

Finally, a comparison was made of the minimal infecting dose of plasma and washed leucocytes, on the same lines as the experiments carried out by SCHEIN.

The leucocyte count of the whole blood was 8,000 per c.mm. and the minimal infective dose of the whole blood was below 0·02 cc. This would contain about 0·01 cc. of plasma. In the experiment the smallest amounts of plasma and leucocytes to give rise to reactions were 0·7 cc. of plasma and 120,000 leucocytes. 0·7 cc. of plasma is about 70 times the amount of plasma present in a minimal infective dose of whole blood, and 120,000 leucocytes represents approximately the number present in a M.I.D. of whole blood.

REMLINGER (P.) & BAILLY (J.). La vaccination locale dans la rage. [**Local Vaccination in Rabies.**]—*Ann. Inst. Pasteur.* 1928. Apr. Vol. 42. No. 4. pp. 349–355. [5 refs.]

The experiments recorded in this paper were carried out at the suggestion of BESREDKA, and their object was to ascertain whether animals treated with anti-rabic vaccine applied to shaved areas are protected against (1) fixed or street virus applied to the same area of skin, and (2) intramuscular inoculation with 3 cc. of a thick emulsion of fixed or street virus.

Guineapigs were thoroughly and closely shaved over the anterior part of the abdominal wall, and thick emulsions of rabic cords which had been dried, four, three and two days and then preserved in glycerin were then energetically rubbed into the skin with a tooth-brush. The animals were kept on the operating table until the area was perfectly dry. This required about half an hour. This treatment was carried out five times with intervals of a few days. A fortnight afterwards these animals with six controls were inoculated by friction in the same way with virus. One of the vaccinated animals died of rabies and the whole of the remainder survived.

Later, another test was carried out on the five survivors, along with six new controls.

Two controls only died of rabies.

A month later they were tested with street virus, fixed virus having been employed in the earlier tests. Six new controls were used. Two of the vaccinated guineapigs and the whole of the controls died of rabies.

In a second experiment 18 guineapigs were vaccinated by friction with cords dried for two to four days. Eight of these were tested with fixed virus along with eight controls and the remaining ten were tested along with ten controls with street virus. Of the group of ten, four and all the controls died of rabies. Of the batch done with fixed virus all survived while two of the controls died.

Seven of the vaccinated guineapigs were subsequently tested with street virus with six fresh controls. One of the vaccinated died accidentally four days after inoculation. All the controls died.

In experiment 3, eight guineapigs were vaccinated by friction, eight times with etherized fixed virus (12 hours to 6 hours). They were inoculated with street virus along with four controls. Of the vaccinated two died of rabies (36 and 63 days). All the controls were still alive and well after five months.

These furnish evidence of the existence of local immunization.

An experiment in which guineapigs were treated with fresh unaltered fixed virus by friction on three occasions and then tested with street virus of low virulence was inconclusive, because all the animals including the controls survived.

Five guineapigs were treated with an ointment containing 2 g. of vaseline, 4 g. of lanoline and 8 g. of fixed virus. Three treatments were given. When tested with controls, using very active street virus all died, but the vaccinated died a day or two later than the controls.

It would appear that a more satisfactory degree of resistance is established when a larger number of vaccinating treatments are given, than when the number is smaller.

In the second series of experiments the test inoculation was given by intramuscular injection.

In the first batch eight guineapigs each received eight frictions with etherized virus (exposure to ether 12 to 6 hours). They were then inoculated intramuscularly with 3 cc. of a thick emulsion of fixed virus. Two of the treated animals and three out of four controls died. In the second experiment of this series the number of vaccinating frictions was reduced to three. When tested by intramuscular inoculation, three out of four vaccinated guineapigs and four controls all died of rabies and there was no difference between the periods elapsing between inoculation and death in the two groups.

When the vaccinating virus was applied as an ointment, the experiment was a complete failure.

ANNALES DE L'INSTITUT PASTEUR. Supplément publié par l'Organisation d'Hygiène de la Société des Nations. Conference Internationale de la Rage. Rapports de MM. MARIE, REMLINGER, et VALLÉE. April 25–29. 1927.

A summary of the proceedings of this conference has already been taken from other sources.

DONATIEN (A.) & LESTOQUARD (F.). La peste du porc en Algérie. Sérothérapie spécifique. [**Swine Fever in Algeria. Specific Serum Therapy.**]—*Rev. Vét. et Jl. Méd. Vét. et Zootech.* 1928. May. Vol. 80. pp. 257–267.

Both swine fever and swine erysipelas are important diseases of the pig in Algeria. Pneumonia due to a pasteurella or a streptococcus and enteritis caused by a Salmonella occur as complications of these, but are only very rarely seen as primary conditions.

Of the two diseases swine fever has the wider distribution, but it does not occur with equal severity in all parts of the country. It occurs as outbreaks which sometimes have long intervals between them. The outbreak of 1925–26 was so serious that many farmers have ceased to keep pigs, although the country is eminently suitable for them.

The only hope of controlling the disease lies in individual immunization.

BREINL (F.). **Effect of Concurrence of Typhus and Rocky Mountain Spotted Fever Infections in Guineapigs.**—*Jl. Infect. Dis.* 1928. Jan. Vol. 42. No. 1. pp. 48–55. With 6 figs. [12 refs.]

These experiments have been carried out on the lines suggested by the effects produced in syphilis by infection with malaria and other concomitant infections.

The present experiments have been carried out with typhus and Rocky Mountain spotted fever viruses.

When these are injected simultaneously into guineapigs they apparently exert no influence upon each other, and immunity to each is established.

If the virus of typhus be injected first, and the spotted fever virus be injected during or immediately after the febrile reaction caused by the former, the second injection modifies the course of the disease caused by the first virus.

If the spotted fever virus be given first it protects a guineapig against a smaller dose of typhus virus given on the first day of the

febrile reaction, but this protection is not specific and is transitory. If larger doses of typhus virus are given there is a response but the infection runs a mild course.

MISCELLANEOUS.

SCHELTENKOW (A.). Sterilisierung und Konservierung des Blutes, Serums, und der Aszitesflüssigkeit für die Nährböden. [**The Sterilization and Preservation of Blood, Serum, and Ascitic Fluid for Culture Media.**]—*Rev. Microbiol. et Epidémiol.* 1927. Vol. 6. No. 3. German summary pp. 381–382. [In Russian pp. 342–345.]

The author uses glycerin for the purposes named in the proportion of 40 per cent. Provided the materails are not seriously contaminated, sterilization can be effected at 5° to −10° C. in 7 to 10 days.

Heavily contaminated liquids with 40 per cent. glycerin can be sterilized in 10 to 20 days at 17° C. Except for haemolysis no change occurs in the liquids.

In using the preserved liquids for the preparation of culture media the amounts added should be such that the percentage of glycerin does not exceed 2.

It is an advantage to have such media handy and ready for use. The mixtures can be made in bulk and then put into small flasks.

NIKANOROV (S.). **A New Principle in the Construction of Coloured Differential Media.**—*Rev. Microbiol. et Epidémiol.* 1927. Vol. 6. No. 3. English summary pp. 374–375. [In Russian pp. 280–282. With 9 figs.]

The author suggests that instead of using media containing carbohydrates and an indicator, carbohydrate-free Martin's broth and indicators may be used. He gives the composition of a medium which he has used for the differentiation of *B. pestis* and *B. pseudotub. rodent.*

Martin's yeasted (carbohydrate-free) broth	100·0
Cresol red	0·01
Agar powder	20

(There appears to be an error in this formula, either in the amount of broth or of agar.)

There is no change of colour with *B. pestis*, while the *Bac. pseudotub. rodent.* causes it to assume a deep red colour.

The author suggests that methyl green may be used as an indicator.

GRACE (A. R.). **A New Method for the Preparation of Bacteriological Culture Media containing Agar.**—*Australian Jl. Experim. Biol. & Med. Sci.* 1927. Dec. Vol. 4. Pt. 4. pp. 269–270. With 1 text fig.

"It has been experimentally established that the lower the temperature of filtration of agar medium, below 100° C., the less nutritive the resultant medium; also the less heating to which the medium has been subjected the higher the growth factor of the end product.

"The following method was devised to give a clear medium from unwashed agar filtered above 100° C. There is little heating, but the method is simple and gives uniform results with little loss of nutritive value and bulk.

"The method involves making two stock preparations—a clear agar jelly and nutrient broth."

In making up a litre of nutrient agar the following plan is adopted.

Two pieces of fine gauze about a foot square have placed between them a layer of cotton wool a few millimetres thick. The centre of this filtering pad is pushed down into the neck of a 1 litre Erlenmeyer flask. Twenty-seven grams of granular agar are placed in the depression so formed, and the gauze is then tied tightly above the agar forming a bag. The excess of gauze is cut away. The bag of agar is then lowered down into the flask, the string supporting it being held by a rubber band round the neck of the flask.

750 cc. of distilled water are then poured in and the bag is allowed to float freely. The whole is autoclaved at 120° C. for 25 minutes, and when cooled again, to 100° C., it is removed from the autoclave. The bag is then raised above the level of the liquid and the flask is autoclaved again at 110° C. for 10 minutes. The agar drains out of the bag, and when the medium is set a clear jelly is formed. The reaction is then adjusted. [It would appear that the reaction should be adjusted before setting takes place.—ED.]

Quadruple strength meat extract broth is added in the proportion of 250 cc. to 750 cc. of agar jelly.

The quadruple strength broth is prepared in the usual way, save that only one quarter of the usual amount of water is used in the making.

ZEISS (Heinz). Ein Beitrag zu den Tropenkrankheiten der Haustiere in Südostrussland. [**The Tropical Diseases of Domesticated Animals in South Eastern Russia.**]—*Deut. Tierärzt. Wochenschr.* 1927. June 4. Vol. 35. No. 23. pp. 364–367. With 3 text figs.

Three diseases are described in this paper, namely, filariasis of the camel, "Sarbun" of the Kirgiz sheep, and "Siburlak" of the horse. Filariasis of the camel was first described by JAKIMOFF, and the author is of the opinion that JAKIMOFF's description leaves something to be desired. A full report is promised in conjunction with ILOVAISKY, who collected material during investigations in South Eastern Russia in 1922–23. Filariasis of the camel is not associated with any clear clinical picture. The swelling of the glands of the neck may be associated with Su-auru and not with the filariasis. This question, however, requires investigation. The percentage of camels affected would appear to range from 0·25 to 0·5 per cent.

"Sarbun" is the name given to a disease which affects sheep irrespective of age or sex when at pasture in summer. The name means "yellow joint." It is not known whether the disease is contagious or not. The disease appears at intervals only, and does not seem to be connected with wet or dry seasons. Little is known regarding the geographical distribution of the condition, but the author believes that it occurs on both sides of the Ural river.

The first symptom is stiffness of gait, one or more limbs may be affected and show painful swelling of one or more joints. Appetite is lost, and as a result of their inability to move about and graze loss of condition is very marked. Death generally takes place in about a month if the animals are not slaughtered.

Examination of affected limbs shows that the tissues surrounding affected joints are saturated with a clear yellow exudate. The joints

themselves may contain a similar liquid or they may contain thick pus. In some cases the joints burst and the pus escapes. Sometimes the joints of the spinal column are affected. The pericardium contains an excessive quantity of clear yellow liquid. Nothing is known as yet regarding the cause of the disease.

" Siburlak " or grass poisoning of horses is a disease caused by the ingestion of *Centaurea picris*, Pall.

Symptoms make their appearance in 1 to 4 hours after the fresh plant has been eaten. Affected animals show rigors and sweating, and then loss of co-ordination. Later, convulsions occur and finally death takes place. The mortality is about 75 per cent., and all horses introduced into the Ural district are likely to be affected. Native horses appear to acquire an immunity. The plant is harmless for camels, cattle and sheep.

Dogs, mice, and frogs were used in experimental investigations, but watery infusions or alcoholic mixtures introduced either into the stomach or under the skin failed to cause any symptoms.

MARSH (C. Dwight) & ROE (G. C.). **Wild Tobaccos** (*Nicotineana trigonophylla* **Dunaal and** *Nicotineana attenuata* **Torrey) as Stock Poisoning Plants.**—*U.S.A. Dept. Agric. Tech. Bull. No. 22.* 1927. Dec.

Both plants are poisonous to cattle, horses and sheep, producing typical tobacco symptoms. These appear soon after feeding and may continue for a considerable time.

The plants are more likely to produce fatal results in cattle than in other species, and cattle were found to be far more susceptible to their action than sheep. The plants occur in the western part of the States, and in Mexico. *N. attenuata* extends further north than *N. trigonophylla*, but the latter in turn occurs further south than *N. attenuata*.

In the case of *T. trigonophylla* the toxic and lethal doses are as follows:

Species.	Min. Toxic Dose.	Min. Lethal Dose.
Cattle	0·5 per cent. body weight	2 per cent. body weight
Sheep	1·42 ,, ,,	3·25 ,, ,,
Lambs	1·5 ,, ,,	Not determined.
Horse	0·68 ,, ,,	,, ,,

MOUSSU (G.). Distomatose et accidents causés par l'extrait éthére de fougère male. [**Distomatosis and Accidents caused by Ethereal Extract of Male Fern.**]—*Rec. Méd. Vét.* 1928. May. Vol. 104. No. 5. pp. 257–263.

The author quotes a number of instances in which accidents occurred following the use of extract of male fern to give point to his demand that greater care and accuracy should be used in manufacture of the extract, and that every attempt should be made to prepare the pure active principles.

DONATIEN & LESTOQUARD. L'élevage algérien et les principales maladies microbiennes de l'Algerie. [**Animal Breeding and the Principal Microbial Diseases in Algeria.**]—*Receuil Méd. Vét. Exot.* Paris. 1928. Jan.-Mar. Vol. 1. No. 1. pp. 24–29.

This paper is a brief summary of the activities concerning animals bred in Algeria and of the diseases due to bacteria, protozoa, and filterable viruses which affect them.

SCHEIN (H.). Les principales maladies contagieuses du betail en Indochine. [**The Principal Contagious Diseases of Animals in Indochina.**]—*Receuil Méd. Vét. Exot.* Paris. 1928. Jan.-Mar. Vol. 1. No. 1. pp. 6–23.

This paper is an abstract of a report published in October 1926. It is a survey of the diseases occurring in Indochina, their economic importance, control, etc.

REVIEWS AND NOTICES.

CHOPRA (R. N.) [M.A., M.D. (Cantab.), Major, I.M.S., etc.] & CHANDLER (Asa C.) [M.Sc., Ph.D., Professor of Biology, Rice Institute, Houston, Texas.] **Anthelmintics and their Uses in Medical and Veterinary Practice.**—pp. xii+291. With 65 figs. on 5 plates. 1928. London: Baillière, Tindall & Cox, 8, Henrietta Street, Covent Garden, W.C. 2. [22s. 6d.]

The authors point out that no book dealing exclusively with the subject of anthelmintics has hitherto been published; the work under review has been compiled to fill this gap. Whereas, in many text books, treatments are mentioned, such information is very scattered and much must also be sought for in a multiplicity of periodicals. Those acquainted with modern literature will not anticipate a wealth of new material; in presenting their own views the authors have adopted a broad outlook and have quoted the work of other observers in an impartial manner. Perhaps for this reason the student will experience some confusion in selecting a treatment for a specified condition and more especially the veterinarian, since the authors speak more authoritatively on human than animal posology.

The medical and veterinary aspects are contrasted, a procedure of benefit to the reader and one may here draw attention to the high and varying toxicity of carbon tetrachloride towards human and animal life. A more detailed account of the, as yet, unexplained deaths in cattle and sheep following its use would have been welcomed and the omission of a caution in this respect is to be regretted.

On page 87 reference is made to keratine coated pills, a method of doubtful value.

One sees no reference to the sugar floatation method of detecting worm infestation.

The administration of cocaine to cats to prevent vomition, page 93, will not find favour in Great Britain.

The numerals appended to the key on page 49 would have been more easily understood had there been an explanatory footnote.

The index is clear and allows the reader to find his subject with the minimum of trouble.

The publishers have turned out the edition in their customary, pleasing style and in correlating and condensing the present-day knowledge of this extensive subject into a concise volume the authors are to be congratulated. Both investigators and clinicians will welcome the publication.

A. R. Smythe.